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NASA TECH BRIEF



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Low Cost Lobed Bearing

High-speed, lightly loaded rotors running in plain journal bearings lubricated with low viscosity fluids, such as water or air, are inherently unstable. Instability here refers to self-excited fractional-frequency whirl, or the tendency of the shaft center to orbit the bearing center at an angular velocity about half that of the shaft around its own center.

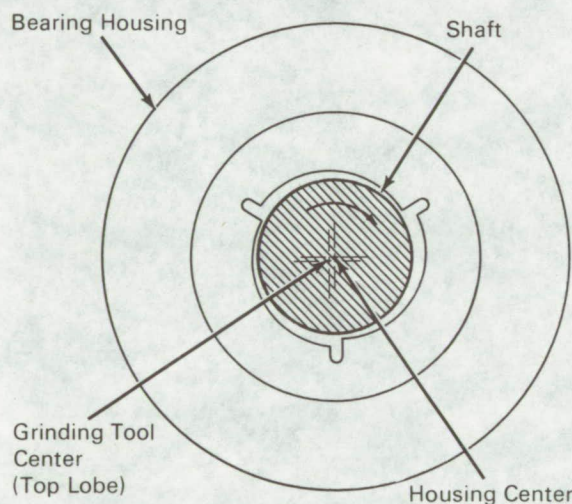


Figure 1. One-Piece Three Lobed Conventional Bearing

A number of self-acting-bearings of fixed geometry that exhibit good stability characteristics have been studied. One of these is the lobed bearing. Conventionally, this type of bearing is made in one cylindrical piece, (See Fig. 1), and is lobed at the midpoint of each lobe arc.

This new technique, shown in Figure 2, utilizes separate sectors for each lobed area of the bearing. During fabrication, each sector is assembled into the bearing housing individually and bolted tightly against the housing inside diameter by two hold-down screws.

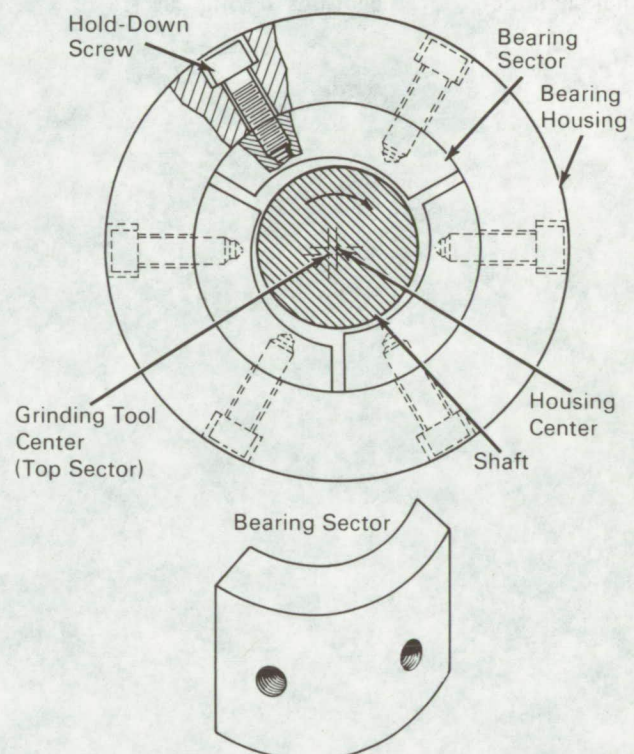


Figure 2. Lobed Bearing

The center of a grinding wheel and the center of the housing are then offset from each other to result in the desired inner radius and tilt of the sector. When the first sector is finish machined, it is removed and the next sector is mounted in place and machined using the same initial setup. This is repeated for the remaining sectors that make up one bearing. Additional sectors can be made at the same time to be used for replacement parts. When all desired sectors have been completely machined, they are installed in the housing to make one complete bearing. A circumferential sur-

(continued overleaf)

face trace can be made of the assembled bearing inside diameter to insure that each sector has the desired profile.

With the multisector lobed bearing, replacement of excessively worn or failed parts is simple. If excessive bearing wear or failure occurs, replacement requires only removing the hold-down screws that hold each sector to its housing, and replacing the worn or failed sectors with the pre-machined extra parts at hand. Removal of the bearing housing and reboring of the bearings are unnecessary.

Rotors 1-1/2 inches in diameter by 1-1/2 inches long were tested in lobed bearings having three separate sectors that were tilted at the trailing edge of the sectors. Tests were run in water at speeds to 9000 rpm with stability thresholds in excess of those for herringbone-grooved bearings in some cases.

Notes:

1. This bearing innovation can be used to support rotating shafts where bearing stability is critical or where simple and economical replacement of the bearing is desired.
2. No additional documentation is available. Specific questions, however, may be directed to:

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Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

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